



# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### Vehicle Wheel having Tubeless Air-filled Tyre

We, KRONPRINZ AKTIENGESellschaft, a German Body Corporate, of Weyerstrasse 112-114, Solingen-Ohligs, West Germany, do hereby declare the invention for which we pray  
5 that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a method for joining  
10 the rim of a vehicle wheel to its tubeless pneumatic tyre.

Tubeless pneumatic tyres are being used in ever increasing numbers for vehicle wheels. Hitherto, it was tried to employ the usual type  
15 of rim and merely take steps to ensure a good seal of the air chamber of the tyre.

When using tubeless tyres on the wheels of light and medium vehicles, a one-piece well-base rim is usually used to facilitate assembly  
20 and removal of the tyre. For the wheels of heavy lorries, well-base one-piece rims cannot be used because the tyre dimensions do not permit tyre deformation to the extent required for assembling and removing it. As is known,  
25 the wheel rims for heavy vehicles are therefore generally in the form of multi-piece flat-base rims. However, the latter are undesirable for tubeless tyres because it is exceedingly difficult to seal the joints between the rim parts  
30 efficiently.

The invention is based on the understanding that, in general, a tubeless tyre does not have to be removed from the rim for the purpose of making tyre repairs. According to the invention,  
35 the tyre is inseparably mounted on a one piece flat-base rim which is a removable component of the wheel, by cold-working the rim to a preliminary shape which permits the tyre to be mounted and, after mounting, cold  
40 working the rim to its final shape so that the two parts are separable only by destroying one or the other of them. The base of the flat-base rim can be cylindrical. If, however, the seating faces for the beads of the tyre are  
45 formed conically in the manner of the so called

tapered bead seats, very simple rim shapes are obtained for any desired tyre size.

Special precautions for sealing the air space within the tyre are not required. If necessary, the efficiency of the seal can be further increased  
50 by cementing or vulcanizing the tyre beads to the rim. Normally, the beads of tyres have wire inserts but jointing of the rim to the tyre as now proposed dispenses with wire inserts or the like. The task normally performed by wire  
55 inserts, viz: the transmission of forces acting on the tyre in a tangential or transverse direction and to take up the forces set up by the tyre pressure, is now undertaken by the adhesive or vulcanized joint between the beads and the rim.  
60

The faces of the rim directed towards the tyre are preferably provided with a corrosion-resistant layer. This allows for the fact that these faces are no longer accessible after joining  
65 the rim to the tyre and are subjected to the action of the moisture contained in the air with which the tyre is filled.

The inseparable joint between the rim and the tyre requires that, once the tyre is worn out and has to be renewed, the rim also has to be renewed. However, in view of the long life  
70 of tyres used nowadays, the manufacturing cost of the simplified rim is negligible compared to the cost of buying a tyre and the old rim can be sold as scrap together with the worn tyre.  
75 This loss is more than compensated for by other important advantages. It is possible to use the simplified rim together with any size of tyre. The air space is absolutely effectively sealed. In addition, compared to known well-base rims, dispensing with the well base saves  
80 a considerable amount of space for accommodating the brake drum. This saving in space is particularly important because in the course of developing pneumatic tyres for vehicle  
85 wheels it is endeavoured to increase the flexible tyre volume by retaining a constant outer tyre diameter and correspondingly decreasing the diameter of the rim.

There are several ways of making an in- 90

separable joint between the rim and the tubeless tyre in accordance with the invention. For example, the rim can be shaped into the final flat-base profile but with smaller radial dimensions. It is then inserted into the pneumatic tyre and finally expanded to bear sealingly against the beads of the tyre. It is also possible firstly to shape only one side of the rim to its flat-base flanged profile having the final dimensions and to complete flanging of the rim after the tyre has been pushed on it from the unflanged side. Alternatively, a cylindrical ring can be inserted in the tyre and which is finally flanged on both sides and shaped to form a flat-base rim.

In order that the adhesive or vulcanized joint between the beads and rim may be efficient, the joint must be made carefully. The beads and the rim are preferably pressed against each other during the cementing or vulcanizing process by supporting the tyre and the rim against fixed abutments and setting a large excess pressure within the tyre. A two-piece pressure-resistant mould which encloses the tyre and rim can be used for this purpose. This permits any desired high pressure within the tyre without harming it. If necessary, heating means such as an electric induction heating apparatus can be provided to produce the localized heat which is required at the joining portions for vulcanization.

The invention will now be described with reference to the accompanying drawings, in which:—

Fig. 1 is a sectional elevation of a tubeless pneumatic tyre joined to a flat-base rim.

Figs. 2 and 3 are two sectional elevations each illustrating a different way of making a joint between the tyre and the rim.

Fig. 4 is a sectional elevation illustrating the manufacture of an adhesive or vulcanized joint between the beads of the tyre and the rim.

As shown in Fig. 1, the rim *a* for the tubeless pneumatic tyre *b* is of flat-base form having tapered bead seats *a*<sub>1</sub> for the beads *b*<sub>1</sub>. The beads may be joined by adhesion or vulcanization to the seating faces *a*<sub>1</sub> and also to the rim flanges *a*<sub>2</sub>. The surfaces of the rim which face the tyre are provided with a corrosion-resistant layer *c*. An elastic lacquer may be used for this layer. Alternatively, it may be produced by phosphating the surfaces to be protected.

To join the tyre and rim, the flat-base rim *a* may firstly be profiled to smaller radial dimensions, as shown in Fig. 2, then inserted into the tyre and finally expanded to such an extent that the beads are brought into sealing engagement with the tapered bead seats *a*<sub>1</sub> of the rim *a*.

Another way of making the joint between the tyre and the rim is shown in Fig. 3. The rim is first profiled at only one of its sides by shaping a cylinder to form the tapered bead seat *a*<sub>1</sub> and the flange *a*<sub>2</sub>. The tyre is then

pushed on from the unflanged side and finally the other tapered bead seat *a*<sub>1</sub> and flange *a*<sub>2</sub> are formed. Since in this case the base of the rim has its end-dimensions right from the start, the connecting elements necessary for fastening the rim to the other wheel components can be welded or otherwise joined to the rim before the tyre is mounted.

For adhering or vulcanizing the beads to the rim, Fig. 4, the rim *a* and tyre *b* are inserted in a mould which consists of two parts *d*<sub>1</sub>, *d*<sub>2</sub> placed end to end and the shape of which conforms to the shape of the tyre and rim. Compressed air or other pressure means are introduced into the tyre through the valve *e* to set up a high internal pressure. The tyre and rim are tightly connected to each other under the action of the internal pressure and, if necessary, with the application of heat. The strength of this joint is sufficient to transmit to the rim all forces which may in operation act on the tyre peripherally and transversely as well as radial and axial forces set up by the internal pressure of the tyre. This permits the use of a tyre without wire inserts or the like in the beads because the inseparable joint between the tyre and rim performs the task usually set the wire inserts or the like.

What we claim is:—

1. A method for joining the rim of a vehicle wheel to its pneumatic tyre, in which the rim is cold worked to a preliminary shape which permits the tyre to be mounted thereon and that, after such mounting, cold-shaping of the rim is completed in a manner so that finally the tyre cannot be separated therefrom without destroying either part.

2. A method according to claim 1, in which the rim has a flat-base profile, the preliminary shape of the rim having the final flat-base profile with smaller radial dimensions than the end dimensions and shaping being completed by expanding the rim until it sealingly engages the beads of the tyre.

3. A method according to claim 1, in which the rim finally has a flat-base profile, the preliminary shape of the rim having only one side of the final flat-base flanged profile and end dimensions and the tyre being mounted from the unflanged side of the rim.

4. A method according to claim 1, in which the preliminary shape of the rim is cylindrical.

5. A method according to any preceding claim, in which the tyre and rim are additionally joined by means of vulcanization.

6. The method for joining the rim of a vehicle wheel to its pneumatic tyre, substantially as hereinbefore described with reference to the accompanying drawings.

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Fig. 1

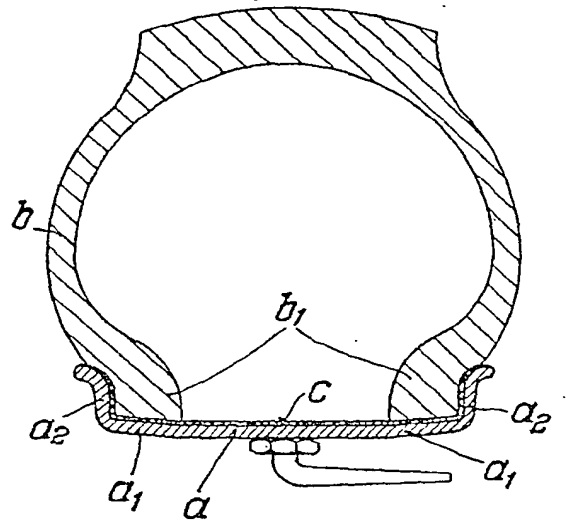


Fig. 2

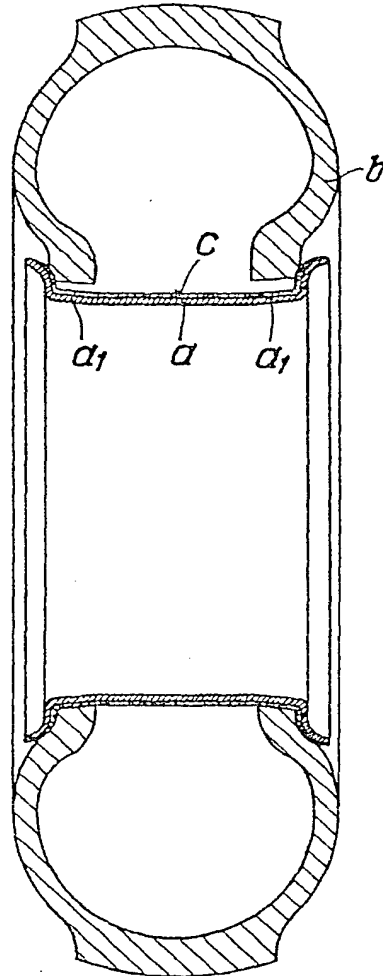
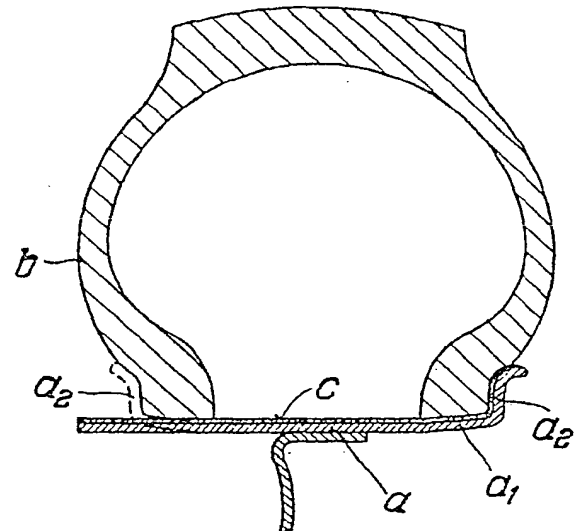


Fig. 3



794,779  
2 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of  
the Original on a reduced scale.  
SHEETS 1 & 2

Fig. 4

